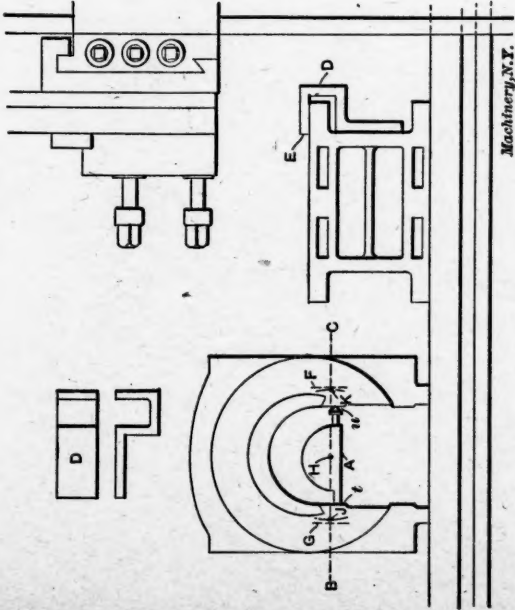


SHOP OPERATION SHEET NO. 70.

Arthur J. Humphrey.

MACHINERY, August, 1908.



To Lay Out a Driving-box for Re-planing the Shoe and Wedge Faces.

1. Place the driving-box on the bed of the planer, as shown, with the inside face toward the operator.
2. Fasten a center-piece A in place, setting it so that it will be flush with the face of the box. With a surface gage draw the line B-C across the center-piece and the flanges of the box. If the crown brass is new, draw this line just below the points of the brass, as shown, but if the brass is worn, the line should be about the same height as the center of the bore of the brass.

NOTE—When the brass is old and is to be re-bored, the line B-C is drawn across the center of the bore so that the center H may be located with reference to the brass, in order that a minimum amount of metal may be removed when re-boring.

3. Hold the box gage D firmly against the shoe or wedge bearing surface of the driving box, as shown, and using the edge E of the box gage as a guide, draw the line F on the outside of the flange. This line, which is in the same plane as the shoe or wedge bearing surface, intersects the line B-C. Repeat this operation on the opposite side of the box, drawing the line G which also intersects the line B-C.

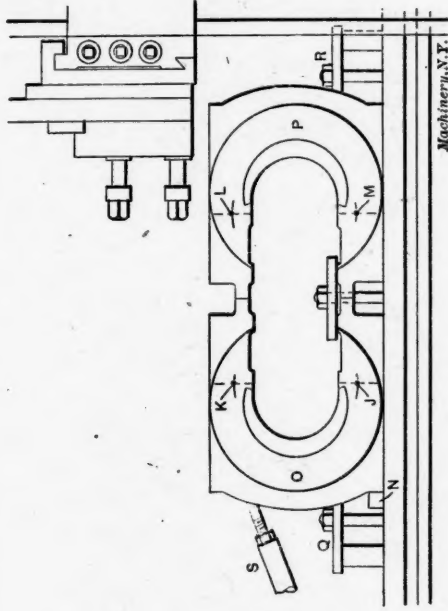
4. With a pair of hermaphrodite calipers locate a center H midway between the points I and U. With a pair of dividers see if the distance from the lines F and G to the center H are equal. If not, set the dividers 1/16 inch less than the smallest distance, or enough less to allow for planing, and with H as a center, scribe arcs intersecting the line B-C, thus locating the points J and K.

5. Mark the points J and K lightly with a prick-punch, and lay out the other box in the same manner, locating the corresponding points.

SHOP OPERATION SHEET NO. 71.

Arthur J. Humphrey.

MACHINERY, August, 1908.



To Set Up a Pair of Driving-boxes for Re-planing the Shoe and Wedge Faces.

NOTE—The driving-boxes are supposed to have been laid out as previously described, and the points J, K, L, and M, located on the outside of the flanges, these points being in the same plane that the shoe or wedge bearing surfaces of the boxes are to be, when planed.

1. Place the boxes on the planer table, with their bottoms together and with a bolt inserted between them, as shown in the illustration.

2. Insert stop plugs N, which are for taking the thrust of the cut, in the table, and place the driving box O against these plugs, and the box P against O.

3. Now place the clamps Q and R in position, with their ends resting in the oil cavities in the tops of the boxes.

4. With the surface gage test the height of the prick-punch marks K and L, and adjust the box, by placing tin or brass liners beneath the flanges, until these marks are the same height from the table. Using a square, test the face of each driving box, and see if the faces are square with the planer table. If not, they should be set square by again placing liners beneath the box flanges.

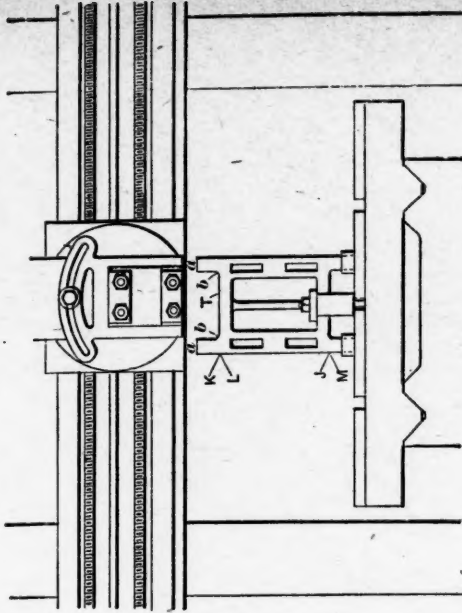
5. Place the surface gage on the planer table, with the rear pins of the gage lowered and held firmly against the edge of the table or T-slot, and test the faces of both boxes, adjusting them until they are parallel with the edge of the table.

6. Fasten the boxes securely to the table, by tightening the clamps, and then, with surface gage and square, again test all points as previously described. If the boxes are not properly set, again loosen the bolts and adjust the liners, and continue to make adjustments until the boxes are set properly. Fix a brace S against one box, as shown, to take thrust of cut.

SHOP OPERATION SHEET NO. 72.

Arthur J. Humphrey.

MACHINERY, August, 1908.



To Re-plane the Shoe and Wedge Faces

NOTE—It is assumed that the points J, K, L, and M, which the faces of the boxes are to be planed, have been located, and that the boxes have been set up as previously described.

1. Clamp a roughing tool in the tool-post of the planer, and take a roughing cut over the flanges of both boxes at a, removing enough metal to true them. Take a roughing cut over the shoe, or wedge bearing surface T, setting the point of the tool 1/32 inch above the prick-punch marks K and L. When taking the roughing cut, be sure to leave enough stock in the corners b for the fillets.

2. Replace the roughing tool with a broad finishing tool, rounded at both corners to the radius of the fillet desired at corners b. Set the cutting edge of the finishing tool the same height as the prick-punch marks K and L, and take a finishing cut over the shoe, or wedge bearing surface T, using a coarse feed. With the rounded corners of the tool finish the fillets at b. With the same tool take finishing cuts over the flanges.

3. Remove the clamps and turn the boxes over, setting them as described in the preceding operation sheet by the points J and M, and plane the faces on the opposite sides until they coincide with these marks.

NOTE—When taking the finishing cuts, the cutting edge of the tool may be set with the points K, L, or J, M, by setting the pointer of the surface gage with the prick-punch marks, and then raising or lowering the tool to correspond with the height of the pointer, or, after the cut is taken over the flanges, the depth of the cut may be determined by the use of a depth gage set to these points. After the finishing cuts are taken, the work may be proved by means of the box gage used in connection with Shop Operation Sheet No. 70.

I, II, III.—DIMENSIONS OF FILLISTER HEAD, STANDARD SQUARE HEAD, AND HEADLESS SCREWS.

Table I.—Fillister Head Screws.	
	A
	B
	C
	D
	E
	F
	No. of threads per inch
Table II.—Square Head Screws.	
	A
	B
	C
	D
	No. of threads per inch
Table III.—Headless Set-Screws.	
	A
	B
	C
	D
	No. of threads per inch

Contributed by Erik Oberg.

IV, V.—DIMENSIONS OF COLLARHEAD, AND STANDARD HEXAGON HEAD SCREWS.

Table IV.—Collar-head Screws.	
	A
	B
	C
	D
	E
	F
	G
	No. of threads per inch
Table V.—Hexagon Head Screws.	
	A
	B
	C
	D
	No. of threads per inch

Contributed by Erik Oberg.

VI, VII, VIII.—DIMENSIONS OF STANDARD, AND SPECIAL HEXAGON NUTS.

Table VI.—Standard Hexagon Nuts.																
	A	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$
	B	$\frac{1}{2}$	$\frac{37}{64}$	$\frac{23}{32}$	$\frac{7}{8}$	$\frac{1}{64}$	$\frac{15}{64}$	$\frac{15}{64}$	$\frac{7}{16}$	$\frac{19}{32}$	$\frac{1}{10}$	$\frac{13}{32}$	$\frac{2}{5}$	$\frac{25}{64}$	$\frac{29}{64}$	$\frac{57}{64}$
	C	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{4}$	$\frac{13}{16}$	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{15}{16}$	$\frac{2}{5}$	$\frac{25}{64}$	$\frac{29}{64}$
	D	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{9}{8}$	$\frac{7}{8}$	$\frac{11}{8}$	$\frac{13}{8}$	$\frac{15}{8}$
	E	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{19}{64}$	$\frac{23}{64}$	$\frac{13}{32}$	$\frac{15}{32}$	$\frac{33}{64}$	$\frac{37}{64}$	$\frac{47}{64}$	$\frac{27}{32}$	$\frac{61}{64}$	$\frac{5}{16}$	$\frac{11}{16}$	$\frac{19}{64}$	$\frac{25}{64}$
	No. of threads per inch	20	18	16	14	13	12	11	11	10	9	8	7	7	6	5
Table VII.—Hexagon Nuts with Special Fine Threads.																
	A	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	1	$1\frac{1}{16}$	$1\frac{1}{8}$	$1\frac{1}{16}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$
	B	$\frac{35}{64}$	$\frac{39}{64}$	$\frac{43}{64}$	$\frac{47}{64}$	$\frac{51}{64}$	$\frac{55}{64}$	$\frac{59}{64}$	$\frac{63}{64}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{13}{32}$	$\frac{1}{2}$	$\frac{25}{32}$	$\frac{29}{32}$
	C	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
	D	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$
	E	$\frac{15}{64}$	$\frac{17}{64}$	$\frac{19}{64}$	$\frac{21}{64}$	$\frac{23}{64}$	$\frac{25}{64}$	$\frac{27}{64}$	$\frac{29}{64}$	$\frac{31}{64}$	$\frac{33}{64}$	$\frac{35}{64}$	$\frac{37}{64}$	$\frac{39}{64}$	$\frac{41}{64}$	$\frac{43}{64}$
	No. of threads per inch	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Table VIII.—Hexagon Check Nuts.																
	A	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{3}{4}$
	B	$\frac{9}{64}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{19}{64}$	$\frac{19}{64}$	$\frac{23}{64}$	$\frac{23}{64}$	$\frac{13}{32}$	$\frac{15}{32}$	$\frac{15}{32}$	$\frac{33}{64}$	$\frac{37}{64}$	$\frac{47}{64}$
	C	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
	D	$\frac{5}{32}$	$\frac{7}{32}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
	E	$\frac{1}{2}$	$\frac{37}{64}$	$\frac{37}{64}$	$\frac{23}{32}$	$\frac{23}{32}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
	No. of threads per inch	32	20	20	18	18	16	16	14	14	13	12	12	11	11	8

Contributed by Erik Oberg.

IX, X, XI.—DIMENSIONS OF WASHERS, T-BOLT HEADS, AND T-NUTS.

Table IX.—Washers.			Table X.—T-Bolt Heads.							Table XI.—T-Nuts.				
A	B	C	Slot.				Bolt-Head.			A	B	C	D	E
$\frac{1}{4}$	$\frac{5}{8}$	$\frac{3}{32}$	A	B	C	D*	E	F	G	$\frac{3}{16}$	$\frac{7}{16}$	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{1}{8}$
$\frac{5}{16}$	$\frac{3}{4}$	$\frac{7}{64}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{7}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{3}{8}$	$\frac{7}{8}$	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{7}{16}$	1	$\frac{9}{64}$	$\frac{3}{8}$	$\frac{11}{16}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{3}{16}$	$\frac{3}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{2}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{7}{16}$	$\frac{13}{16}$	$\frac{7}{32}$	$\frac{9}{32}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{9}{16}$	$\frac{1}{4}$	$\frac{11}{64}$	$\frac{1}{2}$	$\frac{15}{16}$	$\frac{9}{32}$	$\frac{5}{16}$	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{5}{8}$	$\frac{3}{8}$	$\frac{13}{64}$	$\frac{5}{8}$	$\frac{3}{16}$	$\frac{13}{32}$	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{32}{32}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{3}{16}$	$\frac{5}{32}$	$\frac{1}{4}$
$\frac{11}{16}$	$\frac{1}{2}$	$\frac{15}{64}$	$\frac{3}{4}$	$\frac{5}{16}$	$\frac{17}{32}$	$\frac{1}{2}$	$\frac{11}{16}$	$\frac{1}{4}$	$\frac{15}{32}$	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{32}$	$\frac{7}{8}$	$\frac{1}{8}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{7}{8}$	$\frac{3}{4}$	$\frac{1}{4}$	1	$\frac{1}{8}$	$\frac{13}{16}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{11}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
1	2	$\frac{1}{4}$	* Minimum distance permissible. Maximum distance of D equals $A + \frac{1}{16}$ for sizes of bolt up to $\frac{5}{8}$, 1 for $\frac{11}{16}$ size of bolt, $\frac{1}{16}$ for $\frac{3}{4}$ size of bolt, $\frac{1}{16}$ for $\frac{7}{8}$ size of bolt.							$\frac{9}{16}$	$\frac{1}{8}$	$\frac{11}{32}$	$\frac{3}{16}$	$\frac{7}{16}$
$\frac{1}{8}$	$\frac{2}{4}$	$\frac{5}{32}$								$\frac{11}{16}$	$\frac{1}{4}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
$\frac{1}{4}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{3}{4}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{16}$	$\frac{5}{8}$
$\frac{1}{2}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{7}{8}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{5}{16}$	$\frac{3}{4}$
$\frac{3}{4}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
$\frac{5}{8}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
$\frac{11}{16}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
$\frac{3}{4}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
$\frac{7}{8}$	$\frac{2}{2}$	$\frac{5}{16}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$
1	4	$\frac{1}{2}$								$\frac{1}{8}$	$\frac{1}{8}$	$\frac{15}{32}$	$\frac{1}{4}$	$\frac{9}{16}$

Contributed by Erik Oberg.